BEFORE THE
ILLINOIS COMMERCE COMMISSION

COMMONWEALTH EDISON COMPANY	**)**	
	)	
Verified Petition to Determine the Applicability of	**)**	
Section 16-125(e) Liability to Events Caused By the	**)**	**ICC Docket No. 11-0588**
Summer 2011 Storm Systems	**)**	

REBUTTAL TESTIMONY

OF

GEORGE E. OWENS, P.E.

ON BEHALF OF

THE OFFICE OF THE ATTORNEY GENERAL

STATE OF ILLINOIS

MAY 30, 2012

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Q: Please state your name and business address.

A: My name is George E. Owens. I am employed by Downes Associates, Inc. ("DAI"). My business address is 2129 Northwood Drive, Salisbury, Maryland 21801.

Q: Have you been retained in this matter?

A. Yes. I have been retained as an expert witness in this proceeding by the Office of the Attorney General, State of Illinois.

Q: Are you the same George E. Owens that submitted direct testimony in this proceeding?

A. Yes.

Q. What are the purposes and subjects of your rebuttal testimony?

A. My rebuttal testimony clarifies numerous subjects presented in my direct testimony which were misstated and confused by ComEd witnesses in their filed rebuttal testimony. Specifically, these subjects involve ComEd's distribution sectionalizing methods and equipment, the structural integrity and age of ComEd's distribution poles, inspection and testing of pole grounds, the use of 34 KV static shield bayonet brackets, distribution pole loading and guying, effective tree trimming practices, and selective underground placement of overhead lines.

Q. In particular, ComEd witnesses Gannon and Mehrtens imply in their rebuttal testimony that you testified that ComEd should make all switches or sectionalizing devices load-break capable by stating, "Having an arc-interrupting means, like switchgear, built into every disconnect, cutout, power fuse, and dropout recloser on ComEd's overhead distribution system is unnecessary and prohibitive" ComEd Ex. 7.0, 2: 44, 21:458. Was this the intent of your direct testimony?

A. No, not at all. As stated in my direct testimony AG Ex 1.0, 42: 8-19, ComEd would benefit from the installation of one to two additional manual gang-operated load-break switches on each overhead circuit to further enhance sectionalizing operations and storm outage response. Given that ComEd has indicated they have nearly 5,200 circuits on both their 4 KV and 12 KV distribution systems, of which half are overhead and half are underground, my suggestion of one to two gang-operated air break switches for each overhead circuit would suggest a maximum of 4,000 such devices be installed.

In addition, when asked how many single phase hook stick operated disconnects are currently on the ComEd system (Data Request AG 4.20), ComEd's response was that the number was over 360,000 such switches. Therefore, my recommendation for the installation of 4,000 gang-operated load-break capable devices in no way comes close to suggesting all switches or sectionalizing devices be changed to the gang-operated load-break rated type.

Q. Do you have additional comments regarding the installation of gang-operated load-break switches?

A. Yes. The switches of the type I have recommended contain at the very least an operating handle mounted approximately 4 feet above ground level that provides utility crews with an easily operated switch which could be safely and quickly opened or closed under any storm condition.[1] In addition, the cost of labor and materials for installing a manually operated gang-operated load-break switch would be approximately $4,000 as compared to the cost of approximately $1,000 for three single phase non-load-break station class switches of the type utilized by ComEd. The additional material cost to ComEd for installing 4,000 load-break gang-operated switches would be approximately $16 million. Such an investment would yield major improvements in storm restoration efforts, major reductions in outage times, and major reductions in the number of customers affected by prolonged outages as a result of ComEd's ability to more effectively sectionalize and isolate the faulted circuit segments. My recommendation supports ComEd's statement that had more sectionalizing devices been on the ComEd distribution system, it would have improved their ability to restore electric service to potentially 50% of all customers affected by any individual outage.[2]

[1] See AG Exhibit 6.01
[2] See DRR OUT 1.07

Q. You also recommend in your direct testimony that ComEd install a number of SCADA mounted and controlled gang-operated load-break switches on their 4 KV and 12 KV distribution circuits. Can you clarify the use of these SCADA operated devices?

A. Yes. SCADA controlled gang-operated load-break switches allow for the remote operation of the switch from a central location. The ability to perform this task has been advanced greatly by developments in wireless communication and thus allows these switches to be controlled via wireless signals. These types of switches allow the system operator to control switch operation during non-storm and storm events from the safety of a remote operations center. This function allows for circuit sectionalizing and restoration processes without the need to dispatch electric personnel during the worst periods of a dangerous weather event and quickly thereafter. Similar to my earlier recommendation that manual gang-operated switches be installed on ComEd's distribution system, I would recommend that approximately 4,000 SCADA controlled disconnect switches be installed on ComEd's distribution system.[3] These SCADA controlled switches will generally cost between $18,000 and $22,000 installed. Therefore, an investment of $72 million to $88 million could be expected, but once again would yield a vast improvement in the effectiveness of ComEd's storm restoration procedures.

Q. Can you provide greater clarity to your direct testimony pertaining to the need for ComEd to more effectively deploy mid-circuit reclosers (MCR).

[3] See AG Exhibit 6.02

A. Yes. MCRs are positioned, as their name would imply, near the middle of the overall distribution circuit length; that is, at a point where the number of customers served is equally divided. The portion of the circuit between the substation breaker and the MCR is generally referred to as the line side of the recloser and the other portion of the circuit is generally referred to as the load side of the recloser. MCRs, much like substation feeder breakers, have the ability to detect a downstream phase to phase or phase to ground fault. If a substation feeder breaker senses a fault, it will open and the entire circuit is either momentarily without power, or if the fault does not clear itself, the entire circuit is without power until the utility corrects the cause of the fault and subsequently closes the substation feeder breaker. This is where the advantage of the mid-circuit recloser comes in. If a fault were to occur on the load or downstream side of the MCR, the MCR would detect the fault and open. Although customers that reside on the load side of the MCR would see a disruption in service, those customers on the line side of the MCR would see no interruption. In addition, if that disruption was a momentary fault that was able to clear itself, the customers on the load side of the MCR would have only experienced a momentary outage because the MCR has the ability to automatically reset itself. If the circuit fault were more permanent in nature, only those customers located downstream of the MCR would be disconnected from service. These devices cost approximately $25,000 per installed location. ComEd should install one MCR per distribution circuit. These devices are available in both pole-mounted and pad-mounted versions and, therefore, can be installed on both overhead and underground main distribution circuits.[4] With approximately

[4] See AG Exhibit 6.03

1,000 MCRs installed by ComEd on main line circuits at this time, an additional 4,000 MCRs would be needed on ComEd's 4 KV and 12 KV distribution circuits.[5] This would amount to an equipment investment of approximately $100 million. While the cost to install mid-circuit reclosers on each main line feeder on the ComEd distribution system would represent an upfront investment, this single enhancement would yield a major improvement in ComEd's ability to restore electric service to potentially 50% of all customers affected by any individual outage as ComEd stated in their data request response OUT 1.07 to the ICC Staff.

Q. Does ComEd provide any data that would support your recommendation that additional reclosers and/or sectionalizing devices be installed on the ComEd distribution system?

A. Yes, there has been an increase over the past five years in the number of reclosers installed by ComEd on their distribution system.[6] One has to keep in mind that the distribution system includes ComEd's 34.5 KV system, so it is likely that not all of these devices are actually being installed on ComEd's 4 KV and 12 KV main line distribution circuits.

Table 10 of ComEd Ex. 13.0 would lead one to believe the ComEd distribution system is literally saturated with recloser devices because of the vast number of installations that have occurred since 2007. However, when one evaluates the information on the total number of ComEd distribution circuits contained in the same Navigant report, the ratio of main line circuits that have reclosers installed to the total number of circuits produces a ratio of roughly 1 out of every 5 circuits which

[5] See Table 5 of ComEd Ex. 13.0
[6] See Table 10 of ComEd Ex. 13.0

has a recloser installed at some point along the circuit length.[7] This means that approximately 20% of the ComEd distribution system is currently equipped with automated recloser devices. It is my professional opinion that a much larger portion of ComEd's customers should be able to benefit from these devices and the enhanced reliability they provide. The severity and duration of Summer 2011 outages resulted from inadequate sectionalizing equipment utilized by ComEd. Had these additional reclosers been in operation on the ComEd system at the time of the Summer 2011 storms, the severity and duration of these outages would have been greatly reduced.

Q. In their rebuttal testimony, ComEd witnesses Gannon and Mehrtens continue to suggest that the "ComEd's system is designed, constructed, and maintained in accordance with good utility practice, applicable design and construction standards, and all applicable national and state rules and regulations." ComEd Ex. 7.0, 5:111. How do you respond to this statement?

A. I would like to refer back to several poles that were observed during our site visits. A subsequent review of ComEd's construction standards did not illustrate or allow for a single pole similar to the pole shown in AG Exhibit 6.04.[8] Nor would I suspect that any utility would consider this "good utility practice."

In AG Exhibit 6.05, which was taken during our earlier site visits, attention is drawn to the significant deterioration of the pole top.[9] From the weathering and cracking of the pole surface, it is apparent that this condition has existed for a long

[7] See Table 5 of ComEd Ex. 13.0
[8] See AG Exhibit 6.04
[9] See AG Exhibit 6.05

time. Again, good utility practice would have required that this pole be replaced. This pole is typical of numerous poles observed during our site visits.

In AG Exhibit 6.06, also taken during our earlier site visits, attention is drawn to the significant deterioration of the crossarms not only at the ends where the vertical cracks are present, but along the length of the arm where the crossarm integrity has been reduced due to splintering of the crossarm.[10] From the weathering and cracking of the crossarm, it is apparent that this condition has existed for a long time. Again, good utility practice would have mandated this arm be replaced before it reached this level of deterioration.

Q. ComEd witnesses Gannon and Mehrtens also state, "If Mr. Owens claims were true, our system could not have performed as it has year after year or as it currently performs. His claims are, in that sense, very accurately labeled unreal." ComEd Ex. 7.0, 8:183. How do you respond to this statement?

A. My professional opinions regarding the reliability of ComEd's distribution system are supported by the field information collected during our earlier site visits and by the outage experiences that many of the public officials described to us during our visits with them. Many of these municipalities spoke in great detail about the lingering issue of recurring electric outages. One example is the City of Rockford, which experienced 53 outages during 2011 that affected portions of their city's lighting and traffic signal network. Each of these 53 outages lasted a minimum of 8 hours. On average, this is one outage per week for an entire year with the outage duration lasting

[10] See AG Exhibit 6.06

a minimum of 8 hours. This is not my claim, but rather the City of Rockford's, and contrary to ComEd's opinion of their distribution system's reliability, it is very real.[11]

Q. With regards to the sectionalizing methods that were in use by ComEd during the Summer 2011 storm period, ComEd witnesses Gannon and Mehrtens state the use of the Loadbuster Loadbreak tool in the operation of single phase nonload-break switches can be accomplished from one of two locations: (1) a bucket truck and (2) from the ground. ComEd Ex. 7.0, 21:472. How do you respond to this statement?

A. I would simply refer to the product literature for the Loadbuster Loadbreak tool itself.[12] Attention is drawn to page 10 of the Instructions for Operation and Maintenance that clearly show that S&C suggests that a utility utilize either a bucket truck during the use of the Loadbuster Loadbreak tool or that the lineman climb the pole when using the tool. This supports my direct testimony that a bucket truck would be the recommended method to perform the operation for the opening of ComEd's single phase switches. Climbing the pole is certainly an option, but doing so increases the risk of danger to the lineman. Wind loads, heavy rains, or snow loads could cause unstable trees and/or branches to fall into the overhead line placing the lineman in danger if he were located halfway up a pole during switch operation.

With regard to ComEd's suggestion that the Loadbuster Loadbreak tool could be utilized by a lineman from ground level, the task faced by a lineman in lifting the Loadbuster Loadbreak tool on the end of a 30' long extension pole from the ground level to a disconnect switch located 34' in the air must be looked at as daunting at

[11] See AG Exhibit 6.07
[12] See AG Exhibit 6.08

best. To perform this task and successfully open or close three individual single phase switches during normal conditions, let alone during a wind and/or rainstorm event, presents a degree of difficulty that is extreme to say the least. By far, the better plan is to perform these switching operations with ground accessible gang-operated switches, SCADA controlled load-break switches, or SCADA controlled reclosers as described in my direct testimony.

Q. When responding to your recommendations regarding ComEd's system grounding practices, ComEd witnesses Gannon and Mehrtens state, "Mr. Owens' recommendation is, in a word, groundless and should be rejected. ComEd's grounding and multi-grounded systems are adequate and meet or exceed NESC and state standards. Mr. Owens has no basis to claim otherwise." ComEd Ex. 7.0, 23:494. How do you respond to this statement?

A. The recommendations made in my direct testimony were not an attack on ComEd's standards but rather a prudent observation that because of the large incidence of damaging high energy lightning strikes, ComEd should employ more frequent inspection and testing of their pole/circuit grounds and lightning protection system. The inspection and testing which I recommended were to ensure routine verification by field inspection and measurement that the ground resistance values obtained during these periods of inspection are in fact adequate for the grounding components being used and to determine that the overall integrity of the grounding systems had not been compromised through storm damage, vandalism, or copper theft. My recommendations are still prudent courses for ComEd to follow.

Q. Regarding your recommendation that static shield wire can be added to 34 KV lines at a reasonable cost, ComEd witnesses Gannon and Mehrtens state, "Mr. Owens' recommendation should be rejected." ComEd Ex. 7.0, 25:554. How do you respond to this statement?

A. I have two responses. First, ComEd itself stated that the installation of a static shield wire on transmission lines and distribution lines operating at bulk power voltages is a sound and prudent practice.[13] But 34 KV circuits were observed without such a static shield wire.[14] Why would ComEd standards for 34 KV construction indicate the installation of static shield wire if it were not going to be installed? Secondly, 34 KV circuits that are currently without static shield wire can easily be retrofitted to accommodate a static shield wire by using the shield wire bayonet bracket as detailed in my direct testimony.[15] The recommended bayonet bracket installation requires minimal physical requirements and can be installed with a reasonable capital investment. The use of the shield wire bayonet bracket eliminates the need for total pole replacement, thereby saving a great deal in construction costs. In fact, the typical material cost of such a bayonet bracket is approximately $400 per unit.

Q. You spoke in your direct testimony about your concerns regarding the age and condition of ComEd's 4 KV and 12 KV distribution poles. In their rebuttal testimony, ComEd witness's Gannon and Mehrtens suggest that the aging of wood poles is accounted for in the applicable NESC standards. ComEd Ex. 7.0, 36:782. Do you have a response to this statement?

[13] See ComEd Ex. 7.0, 25:556
[14] See AG Exhibit 6.09
[15] See GEO Exhibit 23

A. Yes, I do. ComEd witnesses Gannon and Mehrtens refer to Table 253-2 of the NESC standards which in fact were phased out, and as required by the NESC, shall not be used after July 31, 2010. It appears ComEd is referencing Code standards that are no longer current.

Q. Do you have additional concerns?

A. Yes. In response to Staff Data Request OUT 1.03, ComEd produced Attachment 1 entitled: Compute a Wind Velocity (with Bare Wires) Equivalent to the Minimum NESC Heavy Loading District Pole Strength Requirements (at Replacements) for a Typical ComEd 3-Phase Distribution Pole. Our staff modeled the very pole structure type that ComEd described in that document. With the addition of typical equipment that was observed in our field inspection of ComEd distribution circuits, our model is more in line with actual field conditions because we have added a single pole mounted transformer, an in-line multiplex secondary conductor, in-line communication conductors for CATV and phone, and a single house service drop for secondary electric, CATV, and phone. Although we were not provided actual conductor physical characteristics for CATV and phone conductors, we made reasonable assumptions regarding those values along with typical industry tension values for the service drops.[16]

For our first model, we used a 40'-Class 2 SYP (Southern Yellow Pine) wood pole which is equivalent to the structure ComEd utilized in their initial pole loading calculation from OUT 1.03_Attach 1 dated July 7, 2008. Our analysis indicates this loading condition utilizes 98.1% of the pole's available strength rating with only a

[16] See AG Exhibit 6.10

single in-line CATV and phone circuit as well as a single house service drop for electric, CATV, and phone.[17] Many of the poles I observed during our earlier field investigations were observed with more attachments of numerous cables of these types.[18]

Many of the poles observed during our field visits of ComEd's system demonstrated similar attachments and resulting pole loading. One of the poles observed had unbalanced loading in both the longitudinal and transverse directions without a single guy wire.[19] Note the pole deflection observed.

We also observed other ComEd poles with multiple in-line communication circuits with large diameter cables attached. The diameters of the attached cables are significant because the NESC requires that such poles be evaluated with the attached conductors covered in .5" of ice under the NESC 250B Heavy Loading condition.[20] Larger conductors produce more ice load which results in more surface area, which results in more vertical load and subsequent transverse loads on the pole. The effect of the resultant loading on a pole similar to that shown in AG Exhibit 6.14 is readily apparent when you observe its substantial leaning from its original designed vertical position.

While there may be some recently installed ComEd distribution poles that are constructed using Class 2 poles, the poles observed during our field inspections were much older and more in line with a Class 4 pole and at times, even smaller. Class 2 poles have a minimum diameter of 8 inches at the top of the pole, compared to Class

[17] See AG Exhibit 6.11
[18] See AG Exhibit 6.12
[19] See AG Exhibit 6.13
[20] See AG Exhibit 6.14

4 poles, that have a minimum diameter of 6.7 inches at the top of the pole. (*** I got these numbers from: http://www.cobblumber.com/utility_poles.asp ***)

Q. Has ComEd provided an analysis of the utilization of Class 4 distribution poles?

A. Yes. In ComEd's rebuttal testimony, ComEd Ex 7.01, dated March 9, 2012, they provided an analysis of a 40' Class 4 pole that they indicate is a typical ComEd 3-Phase Distribution Pole. As such, we ran the model again to determine whether the 40' Class 4 SYP wood pole would be sufficient to withstand NESC 250B loading for the ComEd service area.

Our model indicates that when the same loading that was used on the 40' Class 2 pole is applied to the smaller 40' Class 4 pole, the pole becomes overloaded.[21] Again, this analysis applies loads to the pole from ComEd's three phase primary, neutral, and secondary conductors as well as a single in-line CATV, a single in-line phone circuit and just one set of service drop conductors. There are many locations where we observed multiple in-line phone circuits of larger diameters along with multiple service drops attached to a single pole.

The preceding models were evaluated using the applicable criteria for load factors and strength factors as required by the NESC.[22]

Q. Are there any differences between the inputs you used in your model and the inputs used by ComEd?

A. Yes. In our model the wire and structure wind load factor is set at 2.20 rather than the 1.75 wire and structure wind load factor utilized by ComEd in OUT 1.03_Attach 1.[23]

[21] See AG Exhibit 6.15
[22] See AG Exhibit 6.16
[23] See AG Exhibit 6.17

Actually the NESC Table 253-1 requires a load factor for wind "At Crossings" to be 2.20 as opposed to an overload factor of 1.75 for "Elsewhere."[24] There are many instances on ComEd's system where this "At Crossing" designation would be applicable and the higher overload factor would apply.

However, we went back and modeled the same 40' Class 4 pole using an overload factor of 1.75 (ComEd's input) for wind and structure loading. Although the overall loading on the pole was reduced, it was still found to be overloaded at a value of 140.1% of rated pole strength.[25] Any value over 100% indicates the pole or one of its components has exceeded its structural capacity.

Q. How would you summarize the analysis you performed on a typical ComEd distribution pole that you observed during your field inspections?

A. In their direct testimony and subsequent rebuttal testimony, ComEd failed to accurately represent actual field conditions found on their existing distribution poles. Our model calculations apply the appropriate NESC loading criteria as well as incorporate the various levels of loading from longitudinal and transverse supply and communications conductors that we observed to be widespread in the field. Many of the poles that were observed during our site visit to the communities identified in my direct testimony showed the fatigue and resultant leaning that comes with pole overloading.

Q. ComEd witnesses Gannon and Mehrtens suggest the "licensee" (the company making the attachment to a ComEd pole) perform a load study to demonstrate that the additional load placed on poles by "licensee's" facilities will not

[24] See AG Exhibit 6.18
[25] See AG Exhibit 6.19

overload such poles. ComEd Ex. 7.0, 37:797. Do you have any response to this statement?

A. The load study referenced must be performed to ensure that each distribution pole is maintained in an equilibrium state during all weather and loading conditions with minimal, if any, deflection. The photographs of typical ComEd distribution poles in ComEd's service territory obtained during our field visit clearly show that in numerous cases, significant loading imbalances exist to the point that poles leaned severely in an attempt to offset load imbalance and move to a new position where the pole loading is in equilibrium. In some cases, ComEd's facilities are the primary cause for the loading imbalances because primary and secondary conductors have been attached to poles without adequate guying. Guying that otherwise would normally maintain the poles in an equilibrium state and sustain the pole in its originally designed vertical position.[26]

There are other cases of leaning poles where the communication conductors have contributed considerably to the pole displacements from their original vertical state due to inadequate or non-existent guying.[27] If load studies are being performed by the licensee, then ComEd must not be verifying the accuracy of these calculations before giving the authorization for the licensee to proceed with the installation of their communication facilities on ComEd poles. Ultimately, it is the responsibility of ComEd to ensure the continual integrity of the poles on their distribution system.

Q. Do you have further concerns regarding the age of ComEd's wood distribution poles?

[26] See AG Exhibit 6.20
[27] See AG Exhibit 6.21

A. Yes, Figure 13 of Navigant's report indicates that more than 55% of ComEd's approximately 1,054,500 wood poles are 42 years of age or older.[28] While ComEd wishes to debate the fact that the utility industry recognizes the effective life expectancy of a wood distribution pole to be 30 to 40 years, they cannot refute that 588,000 poles which are presently in service on their distribution system are 42 years of age or older; that 388,000 poles are presently 52 years of age or older; 179,000 poles are 62 years of age or older; and 82,000 poles are 72 years of age or older.

The age of the ComEd distribution system has reached the point where ComEd can no longer simply maintain these poles in place as they have been doing historically, but instead must develop a plan to replace them. The median age of ComEd's wood distribution poles continues to rise from 36 years in 2005 to 41 years in 2009.[29] As this median age continues to rise, more and more outages will be experienced as a result of continued pole degradation which contributes to pole weakening, leaning, and failure. ComEd needs to implement a more aggressive pole replacement program so that future electric reliability is not further compromised.

Q. ComEd witnesses Gannon and Mehrtens discuss the method of extending the life of a wood utility pole, found to have ground line decay, by injecting retardant chemicals and by the use of a metal device called a C-Truss. ComEd Ex. 7.0, 33:733. Do you have any comments regarding this issue?

A. While the use of the steel C-Truss has been proven to assist in maintaining ground line pole strength, it does nothing for the remaining pole. Many poles observed during our site visit had significant degradation along the length of the pole. In my

[28] See ComEd Ex. 13.0
[29] See AG Exhibit 6.22

professional opinion, solutions such as the steel C-Truss were developed by the industry to address the issue of premature ground line decay and not to extend the life of a utility pole beyond its useful life.

Q. ComEd witnesses Gannon and Mehrtens suggest "Guys must be installed on wood poles when the applied load exceeds the minimum breaking strength of the wood pole." ComEd Ex. 7.0, 33:714. Do you have a response to this statement?

A. This statement may indicate why many of ComEd's distribution poles observed were severely leaning with a pronounced deflection from the original vertical alignment. ComEd's statement suggests that as long as the minimum breaking strength of the wood pole is not exceeded, then no guying is required. This is not practical in the real world and can lead to leaning, unstable poles, conductor vertical clearance issues, and vulnerable attachments.

We have again modeled a similar pole to that which ComEd described in the OUT 1.03_Attach 1 of their response to OUT 1.03. The only difference with our model versus ComEd's description of the pole was that we introduced a four (4°) degree horizontal line angle on our model pole, and we also made some assumptions regarding the maximum horizontal tension values for each of the circuits attached. We adjusted these tensions until we loaded the pole to approximately 80% of its strength.[30] We have not exceeded the minimum breaking strength of the wood pole and as such, in accordance with the recommendations of ComEd witnesses Gannon and Mehrtens standard practice, we have installed no guys.

[30] See AG Exhibit 6.23

As stated, the pole is loaded to 80% of its structural capacity for the NESC worst case loading condition. While this suggests the pole itself is sufficient, it does not tell the entire story. This pole, when subjected to the NESC 250B loading condition, is only utilizing 80% of the pole's allowable capacity, but it also experiences deflection of 3.5 feet from vertical.[31]

The resultant forces on the unguyed distribution pole cause the pole to move towards a point of equilibrium where the horizontal forces move to a balanced state.[32] The operational value that pole guys provide is the ability to maintain the pole in a state of equilibrium and minimize the deflection caused by any unbalanced loading. The use of guys also helps to maintain the pole in the designed vertical orientation. The lack of guying and the resulting excessive deflection results in movement of the conductors from their designed position. When added to the maximum horizontal conductor displacement at mid span due to wind blow out, pole movement (or leaning) may be a significant contributor to outages caused by tree contact when tree limbs grow or are blown into the area that was not the conductor's originally designed horizontal path.

This relocation of wires, as a result of pole deflection and conductor blowout during wind events, makes it essential that a larger clear space be incorporated into the recommended line clearances to trees and other types of vegetation. In addition, once a pole yields to these unbalanced forces and moves to a leaning position, it stays in that position and will not return to the vertical position that the pole was originally designed for. Finally, the leaning of poles resulting from inadequate guying results in

[31] See AG Exhibit 6.24
[32] See Ag Exhibit 6.25

a pole that is in a more precarious position when subsequent storm conditions occur and thereby add more loading to the pole and attached conductors. A ComEd pole that was photographed in LaGrange is being pulled in the direction of the attached lateral conductors to the left.[33] No guying is provided for this pole to assist in maintaining a vertical alignment. Similarly, a ComEd structure observed in Wilmette, IL shows the result of an un-guyed structure with unbalanced loading.[34] Such unguyed forces place greater stress on poles and these poles become more vulnerable to the additional loadings placed on them during summer and winter storm events.

Q. Regarding ComEd's vegetation management practices, ComEd witness Chesley states, "It is simply incorrect to claim that clearances have not been maintained throughout the service territory." ComEd Ex. 8.0, 11:237. How do you respond to this statement?

A. The statement by ComEd stating that they totally adhere to a four-year tree trimming schedule does not prove that ComEd actually achieves effective tree trimming along rear property lines which cannot be accessed by maintenance vehicles. It is one thing to have ComEd adhere to a four-year trimming cycle by trimming trees along public rights-of-ways where accessibility to the overhead lines is more easily achieved by use of bucket trucks. But for those overhead circuits located along rear property lines where access by vehicles is impossible, the tree trimming crews must climb trees and/or utility poles to effectively trim trees away from conductors. It is our belief that this is not being performed effectively or in some instances, not being performed

[33] See AG Exhibit 6.26
[34] See AG Exhibit 6.27

at all. Many of the areas observed during our site visits do not support ComEd's claim that effective tree trimming is being performed. ComEd claims that circuits are being trimmed; certainly portions of the circuits are being trimmed but in my professional opinion, many portions of these overhead circuits located along rear property lines are not receiving the necessary tree trimming as suggested by ComEd's tree trimming schedule, as illustrated in several of the exhibits to my direct testimony (AG George Owens Direct Testimony GEO-10 and GEO-13).

ComEd's tree trimming schedules demonstrate that designated regions are trimmed in accordance with a four-year cycle. ComEd's tree trimming schedules do not specifically address whether overhead distribution lines located along rear property lines in heavily forested areas are being effectively trimmed at all. Our field observations revealed that they are not being effectively trimmed. These observations were confirmed through discussions with numerous municipal officials as originally mentioned in my direct testimony.

Q. With regard to your recommendation in your direct testimony that ComEd employ selective undergrounding of certain distribution lines along rear property lines, ComEd witnesses Gannon and Mehrtens suggest that you are proposing a misleading and costly fix to an invented problem. ComEd Ex. 7.0, 44:945. Do you have any response to this statement?

A. Yes, I do. In many of the areas observed during my site visit, existing electric facilities are installed along the rear property lines where it is nearly impossible for ComEd crews to access their lines with mechanized equipment after a storm or outage event. This is a result of fully mature trees, fenced yards, storage sheds, etc.

which now block direct vehicular access to the overhead electric facilities. Moreover, these rear property line electric circuits are just as difficult for ComEd's tree trimming crews to access in order to keep up with their four year tree trimming cycle. This, however, in no way absolves ComEd's responsibility to work with residents and do what else is necessary to keep those facilities maintained. Therefore, I recommended in my direct testimony that ComEd consider the option of selective undergrounding of electric lines as a solution for such areas to reduce the number and duration of storm outages, subject to the evaluation of costs when compared to the expense of establishing proper vegetation management in these heavily forested, privately owned areas.

This in no way infers that all circuits should be moved underground, but rather suggests that the evaluation and analysis of the underground conversion of some of ComEd's most worst performing overhead circuits in these heavily forested areas be done if the off-setting cost of routine vegetation tree management and line maintenance justifies such an investment. Thus, my recommendation deals with a prudent business decision based upon a thorough evaluation of the difficulties and costs associated with necessary tree trimming and maintenance programs in these areas. It is not a prudent course to dismiss the need to perform such an evaluation of selective undergrounding of overhead primary circuits in rear property line areas.

Q. Does this conclude your testimony?

A. Yes.